

Fabrication of Magnetically Responsive Agarose Microbeads Doped with Live Microbial Cells

Konnova S., Fakhrullin R.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016, Springer Science+Business Media New York. Here, we report a scalable and rapid method to fabricate magnetically responsive agarose microgels doped with microbial cells. Low-temperature melting agarose and food-grade sunflower oil were used to fabricate microbeads during emulsification and gel setting. Microscopic algae and fungi cells were doped into ~100- μ m-sized beads as single culture or mixed. Magnetic nanoparticles were deposited either on cell walls or on bead walls. We found that the cells encapsulated in magnetically responsive microbeads were viable and able for germination.

<http://dx.doi.org/10.1007/s12668-016-0301-2>

Keywords

Agarose, Encapsulation, Magnetic functionality, Viability

References

- [1] Benita, S. (1996). Microencapsulation: methods and industrial applications. New York: Marcel Dekker.
- [2] Kailasapathy, K. (2002). Microencapsulation of probiotic bacteria: technology and potential applications. *Current Issues in Intestinal Microbiology*, 3, 39–48.
- [3] Konnova, S. A., Kahraman, M., Zamaleeva, A. I., Culha, M., Paunov, V. N., Fakhrullin, R. F. (2011). Functional artificial free-standing yeast biofilms. *Colloid Surface B*, 88, 656–663.
- [4] de Vos, P., Lazarjani, H. A., Poncelet, D., Faas, M. M. (2014). Polymers in cell encapsulation from an enveloped cell perspective. *Advanced Drug Delivery Reviews*, 67–68, 15–34.
- [5] Safarik, I., Pospiskova, K., Horska, K., Safarikova, M. (2012). Potential of magnetically responsive (nano)biocomposites. *Soft Matter*, 8, 5407–5413.
- [6] Zamaleeva, A. I., Sharipova, I. R., Shamagsumova, R. V., Ivanov, A. N., Evtugyn, G. A., Ishmuchametova, D. G., et al. (2011). A whole-cell amperometric herbicide biosensor based on magnetically functionalised microalgae and screen-printed electrodes. *Analytical Methods*, 23, 509–513.
- [7] Orive, G. R., Hernández, M., Gascón, A. R., Igartua, M., Pedraz, J. L. (2003). Survival of different cell lines in alginate-agarose microcapsules. *European Journal of Pharmaceutical Sciences*, 18, 23–30.
- [8] Fakhrullin, R. F., Bikmullin, A. G., Nurgaliev, D. K. (2009). Magnetically responsive calcium carbonate microcrystals. *ACS Applied Materials and Interfaces*, 1(9), 1847–1851.